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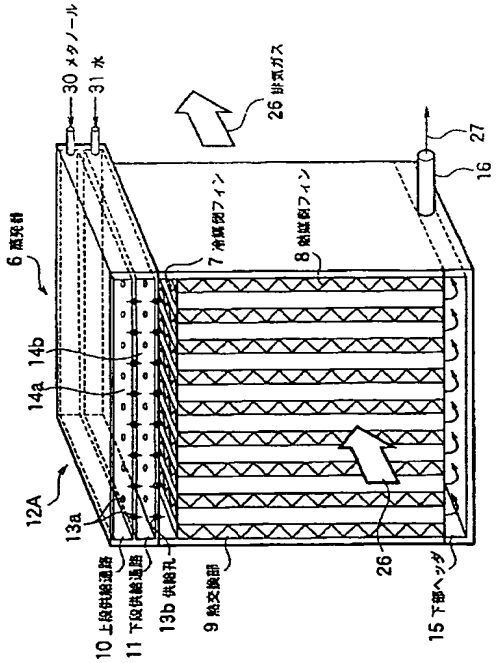
(54)【発明の名称】　燃料電池用蒸発器

(57)【要約】
【課題】　本発明は、メタノールと水の混合比を変えて運転条件を制御する場合に応答遅れ時間を極力短縮することができる燃料電池用蒸発器を提供することにある。
【解決手段】　メタノール３０と水３１をそれぞれ供給する供給通路１０，１１を２段に重ねた上部ヘッダ１２Ａを熱交換部９の直上全面にわたって設置し、各供給通路１０，１１の下面にはメタノール３０、水３１、あるいはメタノール３０と水３１の混合液を通過させる供給孔１３ａ，１３ｂを複数個穿設する。



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【特許請求の範囲】

【請求項１】　メタノールおよび水からなる液体原燃料を気化させて燃料電池本体の燃料となる原燃料蒸気を生成する燃料電池用蒸発器において、

前記メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設してなることを特徴とする燃料電池用蒸発器。

【請求項２】　前記２段に重ねた各供給通路である上段供給通路および下段供給通路の各下面は、ともに平板であることを特徴とする請求項１記載の燃料電池用蒸発器。

【請求項３】　前記上段供給通路の供給孔と略同じ位置に前記下段供給通路の供給孔を穿設してなることを特徴とする請求項１又は２記載の燃料電池用蒸発器。

【請求項４】　前記上段供給通路の供給孔とは外れた位置に前記下段供給通路の供給孔を穿設してなることを特徴とする請求項１又は２記載の燃料電池用蒸発器。

【請求項５】　前記各供給通路の下面は、上段供給通路においては波形板、下段供給通路においては平板とし、前記上段供給通路における波形板の底部を前記下段供給通路の平板と接合し、且つこの接合部において前記上段供給通路の供給孔は前記下段供給通路の平板部を貫通して開口してなることを特徴とする請求項１記載の燃料電池用蒸発器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、燃料電池用蒸発器に関し、特に燃料電池用蒸発器における液体原燃料の供給構造に関する。

【０００２】

【従来の技術】液体原燃料を気化させて燃料電池本体の燃料となる原燃料蒸気を生成する従来の気化部の構成として、例えば、図７に示すようなものが報告されている（「固体高分子型燃料電池の研究開発」新エネルギー・産業技術総合開発機構（平成１０年３月））。

【０００３】気化部は、基本的に、液体原燃料加熱部４１、蒸発部４２、熱回収部４３から構成されている。このうち、蒸発部４２は、液体原燃料滴下板４２ａおよび蒸発板４２ｂにより構成され、液体原燃料滴下板４２ａは液体原燃料が滴下する分散孔を面内に設けた構造であり、滴下した原燃料液滴が下部に設置した蒸発板４２ｂ上で蒸発するようになっている。蒸発板４２ｂは平面内に凹凸状の伝熱フィンを有し、液滴を伝熱フィンの間に滴下させ蒸発面上で蒸発させる。この際、メタノールと水からなる液体原燃料は、気化部の上流側で混合した後に、蒸発部４２に供給する構成となっている。

【０００４】

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【発明が解決しようとする課題】しかしながら、従来技術においては、液体原燃料であるメタノールと水を蒸発部に供給する以前に混合して供給するようになっていたため、メタノールと水の混合比を変えて運転条件を制御する場合には、原燃料供給配管に残存する原燃料を蒸発部へ排出する時間だけ応答性が低下するという問題点があった。

【０００５】本発明は、上記に鑑みなされたもので、その目的としては、メタノールと水の混合比を変えて運転条件を制御する場合に応答遅れ時間を極力短縮することができ、また熱交換部の蒸発性能低下を抑制することができる燃料電池用蒸発器を提供することにある。

【０００６】

【課題を解決するための手段】請求項１記載の発明は、上記課題を解決するため、メタノールおよび水からなる液体原燃料を気化させて燃料電池本体の燃料となる原燃料蒸気を生成する燃料電池用蒸発器において、前記メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設してなることを要旨とする。

【０００７】請求項２記載の発明は、上記課題を解決するため、前記２段に重ねた各供給通路である上段供給通路および下段供給通路の各下面は、ともに平板であることを要旨とする。

【０００８】請求項３記載の発明は、上記課題を解決するため、前記上段供給通路の供給孔と略同じ位置に前記下段供給通路の供給孔を穿設してなることを要旨とする。

【０００９】請求項４記載の発明は、上記課題を解決するため、前記上段供給通路の供給孔とは外れた位置に前記下段供給通路の供給孔を穿設してなることを要旨とする。

【００１０】請求項５記載の発明は、上記課題を解決するため、前記各供給通路の下面は、上段供給通路においては波形板、下段供給通路においては平板とし、前記上段供給通路における波形板の底部を前記下段供給通路の平板と接合し、且つこの接合部において前記上段供給通路の供給孔は前記下段供給通路の平板部を貫通して開口してなることを要旨とする。

【００１１】

【発明の効果】請求項１記載の本発明によれば、メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設したので、メタノールと水が上部ヘッダ部分の各供給通路に各別に供給され、下段の供給通路で混合されて熱交換部に供給されることから、メタノールと水の混合比を

変えて運転条件を制御する場合に応答遅れ時間を極力短縮することができる。

【００１２】請求項２記載の本発明によれば、メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設した構成において、前記２段に重ねた各供給通路である上段供給通路および下段供給通路の各下面は、ともに平板としたので、各供給通路の厚さを極力薄くして、各供給通路の体積をメタノールおよび水の供給量に比べて小さくすることが可能となり、上段供給通路に供給されたメタノール又は水が下段供給通路内で混合された後に熱交換部に均一に圧送供給されることから、メタノールと水の混合比を変えて運転条件を制御する場合に応答遅れ時間をさらに短縮することが可能となる。

【００１３】請求項３記載の本発明によれば、メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設した構成において、上段供給通路の供給孔と略同じ位置に下段供給通路の供給孔を穿設したので、上段供給通路からメタノールあるいは水が直接下段供給通路の供給孔を経由して熱交換部へ供給されやすくなり、メタノールと水の混合比を変えて運転条件を制御する場合に、所定の混合比の原燃料を供給できるまでの応答遅れ時間をさらに短縮することができる。

【００１４】請求項４記載の本発明によれば、メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設した構成において、上段供給通路の供給孔とは外れた位置に下段供給通路の供給孔を穿設したので、メタノールと水の混合が下段供給通路で促進された後に熱交換部に供給されることから、熱交換部の蒸発性能低下を抑制することができる。

【００１５】請求項５記載の本発明によれば、メタノールと水をそれぞれ供給する供給通路を２段に重ねた上部ヘッダを熱交換部の直上全面にわたって設置し、前記各供給通路の下面には前記メタノール、水、あるいはメタノールと水の混合液を通過させる供給孔を複数個穿設した構成において、前記各供給通路の下面は、上段供給通路においては波形板、下段供給通路においては平板とし、前記上段供給通路における波形板の底部を前記下段供給通路の平板と接合し、且つこの接合部において前記上段供給通路の供給孔は前記下段供給通路の平板部を貫通して開口したので、メタノールと水をそれぞれ直接熱交換部へ供給することができ、メタノールと水の混合比を変える場合でも、所定の混合比の原燃料を供給するまでの応答遅れ時間をさらに短縮することができる。

【００１６】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して説明する。

【００１７】（第１の実施の形態）図１は、本発明の第１の実施の形態に係る燃料電池用蒸発器を含む燃料電池システムの構成を示す図である。まず、この燃料電池システムの構成から説明する。

【００１８】図１において、コンプレッサ１は、外部から取り入れた空気（酸素）を燃料電池スタック２および改質システム５に供給する。燃料電池スタック（燃料電池本体）２には、アノード極３とカソード極４が備えられ、改質ガス中の水素と空気中の酸素を用いて発電する。

【００１９】改質システム５には、蒸発器６、この蒸発器６の熱源となる高温の排気ガス２６を生成する燃焼触媒２１、その上流に順次設置されたミキサ２２、気化ヒータ２３およびメタノール供給部２４と気化ヒータ２３を駆動するバッテリ２５とが備えられ、さらに蒸発器６からの原燃料蒸気２７および空気が供給されてメタノール改質を行う改質部２８およびこの改質部２８からの改質ガス中のＣＯを除去するＣＯ除去部２９が備えられている。

【００２０】メタノールタンクにはメタノール３０が貯留され、水タンクには水３１が貯留されている。ポンプ３２ａ，３２ｂは、メタノール３０および水３１を吸引して流量調整弁３３ａ，３３ｂまで供給し、流量調整弁３３ａ，３３ｂでは、蒸発器６で生成される原燃料蒸気２７が改質部２８で必要とされる組成となるようにメタノール３０および水３１の供給量を調整する。

【００２１】図２は、上記の蒸発器６の構成を示している。

【００２２】図２において、冷媒側フィン７にはメタノール３０および水３１からなる液体原燃料が流れ、熱媒側フィン８には高温の排気ガス２６が流れるようになっており、この冷媒側フィン７と熱媒側フィン８の組付け部により熱交換部９が構成されている。

【００２３】また、熱交換部９にメタノール３０を供給する上段供給通路１０と水を供給する下段供給通路１１とが上下２段に重ねられた上部ヘッダ１２Ａが熱交換部９の直上全面にわたつて設置されている。上段供給通路１０の下面１４ａにはメタノール３０を通過させる複数の供給孔１３ａが下面全体にわたり均一に開口され、下段供給通路１１の下面１４ｂにはメタノール３０と水３１の混合液（液体原燃料）を通過させる複数の供給孔１３ｂが下面全体にわたって均一に開口されている。蒸発器６の下部には下部ヘッダ１５と原燃料蒸気排出口１６が設けられている。

【００２４】次に、蒸発器６の作用を燃料電池システム

の動作とともに説明する。

【００２５】改質システム５の起動時においては、コンプレッサ１により空気供給路３４を介して空気３５がミキサ２２に供給開始された後、メタノール供給部２４よりメタノール３０が供給される。メタノール３０は気化ヒータ２３で気化された後にミキサ２２で空気３５と混合され、燃焼触媒２１で燃焼する。

【００２６】また、起動後においては、燃料電池スタック２から排出されるアノードガス３６およびカソードガス３７がミキサ２２に導入されて混合され、燃焼触媒２１で燃焼する。これらの各燃焼の際に生成される排気ガス２６の熱が蒸発器６の熱源として利用される。

【００２７】蒸発器６では、メタノール３０と水３１が、それぞれ流量調整弁３３ａ，３３ｂを介して上段供給通路１０と下段供給通路１１に格別に供給される。メタノール３０は上段供給通路１０から供給孔１３ａを介して一旦下段供給通路１１へ供給され、下段供給通路１１内で水と混合された後に供給孔１３ｂを通過し、液体原燃料として熱交換部９へ供給される。

【００２８】ここで、排気ガス２６と熱交換が行われ、気化した原燃料蒸気２７は改質部２８およびＣＯ除去部２９を通って改質ガス３８となり、燃料電池スタック２のアノード極３に送られる。燃料電池スタック２のカソード極４にコンプレッサ１により空気３５が送られており、ここで改質ガス３８中の水素と空気３５中の酸素を用いて発電が行われる。

【００２９】蒸発器６は、上述のように作用し、メタノール３０と水３１が上段供給通路１０と下段供給通路１１に各別に供給され、熱交換部９直前の下段供給通路１１で混合されて熱交換部９に供給されることから、メタノール３０と水３１の混合比を変えて運転条件を制御する場合に応答遅れ時間を極力短縮することができる。ここで、図２に示されているように、上部ヘッダ１２Ａにおける上段供給通路１０および下段供給通路１１の各下面１４ａ，１４ｂは、ともに平板になっており、複数の供給孔１３ａ，１３ｂが、その下面１４ａ，１４ｂの全体にわたりそれぞれ均一に開口されている。

【００３０】このため、上段および下段の各供給通路１０，１１の厚さを極力薄くして、各供給通路１０，１１の体積をメタノール３０および水３１の供給量に比べて充分小さくすることができる。これにより流量調整弁３３ａ，３３ｂを介して上段供給通路１０と下段供給通路１１に各別に供給されたメタノール３０と水３１は、下段供給通路１１内で混合された後に熱交換部９に均一に圧送供給される。

【００３１】この結果、改質システム５の起動時における熱交換部９への原燃料供給応答遅れ、あるいはメタノール３０と水３１の混合比を変えて運転条件を制御する場合の応答遅れ時間をさらに短縮することができる。

【００３２】また、図３に示されているように、上段供給通路１０の下面１４ａに開口された供給孔１３ａの位置と下段供給通路１１の下面１４ｂに開口された供給孔１３ｂの位置とは同じ位置になっている。

【００３３】これにより、上段供給通路１０からのメタノール３０が直接下段供給通路１１の供給孔１３ｂを経由して熱交換部９へ供給されやすくなるため、原燃料の混合比を変える場合において、所定の混合比の原燃料を供給できるまでの応答遅れ時間をさらに短縮することができる。

【００３４】（第２の実施の形態）図４は、本発明の第２の実施の形態に係る燃料電池用蒸発器の上部ヘッダ部分の構成を示す図である。なお、第２の実施の形態および後述する第３の実施の形態は、図２に示す第１の実施の形態に対応する燃料電池用蒸発器と同様の基本的構成を有しており、同一の構成要素には同一の符号を付し、その説明を省略することとする。

【００３５】第２の実施の形態では、図４に示すように、上部ヘッダ１２Ｂの構成において、上段供給通路１０の供給孔１３ａとは外れた位置に下段供給通路１１の供給孔１３ｂが開口されている。

【００３６】これにより、上段供給通路１０から供給されるメタノール３０は直接熱交換部９へは供給されずに、一旦下端供給通路１１で保留されて水３１との混合が促進される。このため略均一に混合された原燃料が熱交換部９に供給されて、熱交換部９の蒸発性能低下を抑制することができる。

【００３７】（第３の実施の形態）図５は、本発明の第３の実施の形態に係る燃料電池用蒸発器の構成を示す図である。

【００３８】第３の実施の形態では、図５に示すように、上部ヘッダ１２Ｃにおける上段供給通路１０の下面は波形板１７ａとなっており、且つ波形板１７ａの底部１７ｂが下段供給通路１１における平坂からなる下面１４ｂと接合されている。

【００３９】そして、この接合部において上段供給通路１０の供給孔１３ａが下段供給通路１１の下面１４ｂを貫通して開口されている。上段供給通路１０は、下面の波形板１７ａと平面状の上面板１８との間に所定の間隔を設けてあり、各波部１７ｃが連通可能な構成となっている。

【００４０】図６に示すように、上段供給通路１０における各波部１７ｃの一端側は隔壁板１９で閉塞されている。下段供給通路１１は、上段供給通路１０における波形板１７ａの裏面と平板からなる下面１４ｂとの間に形成される複数の角柱状中空部により構成され、この下段供給通路１１を構成する複数の角柱状中空部は仕切板２０と平板からなる下面１４ｂとの間の空間により連通している。

【００４１】第３の実施の形態は、このように構成されているので、上段供給通路１０又は下段供給通路１１か

ら直接熱交換部９にメタノール３０又は水３１を供給することができる。

【００４２】このことにより、メタノール３０および水３１の供給通路を上下に重ねて構成する場合でも、各々個別に流量制御を行って熱交換部９に供給することができ、原燃料の混合比を変える場合でも応答遅れを抑制して制御することができる。

【００４３】なお、上述した各実施の形態では、上段供給通路１０をメタノール通路、下段供給通路１１を水供給通路としてあるが、上段供給通路１０を水供給通路、下段供給通路１１をメタノール供給通路としても作用、効果は上記と同様である。

【図面の簡単な説明】

【図１】本発明の第１の実施の形態に係る燃料電池用蒸発器を含む燃料電池システムの構成を示す図である。

【図２】本発明の第１の実施の形態に係る燃料電池用蒸発器の構成を示す斜視図である。

【図３】第１の実施の形態の上部ヘッダ部分の構成を示す図である。

【図４】本発明の第２の実施の形態に係る燃料電池用蒸＊発器の上部ヘッダ部分の構成を示す図である。

【図５】本発明の第３の実施の形態に係る燃料電池用蒸発器の構成を示す斜視図である。

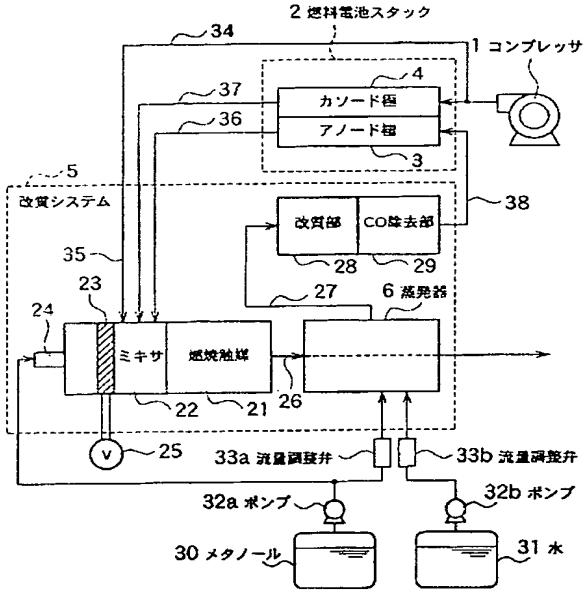
【図６】第３の実施の形態の上部ヘッダ部分の構成を示す分解斜視図である。

【図７】従来の燃料電池システムにおける気化部の基本構成を示す図である。

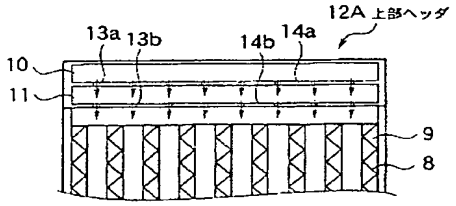
【符号の説明】

２　燃料電池スタック（燃料電池本体）
６　蒸発器
９　熱交換部
１０　上段供給通路
１１　下段供給通路
１２Ａ，１２Ｂ，１２Ｃ　上部ヘッダ
１３ａ，１３ｂ　供給孔
１４ａ，１４ｂ　平板からなる下面
１７ａ　波形板
１７ｂ　波形板の底部
３０　メタノール
３１　水

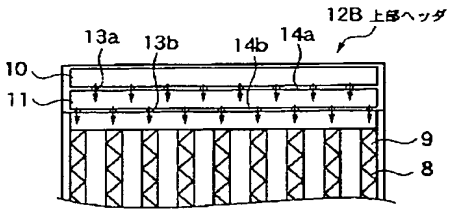
【図１】



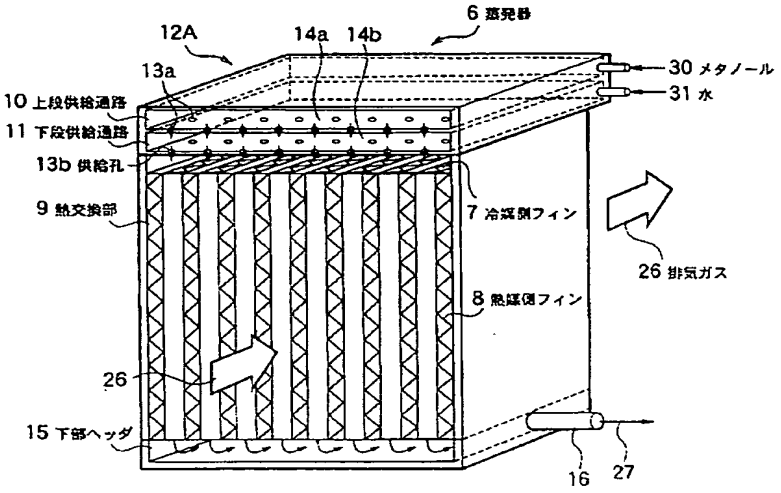
【図３】



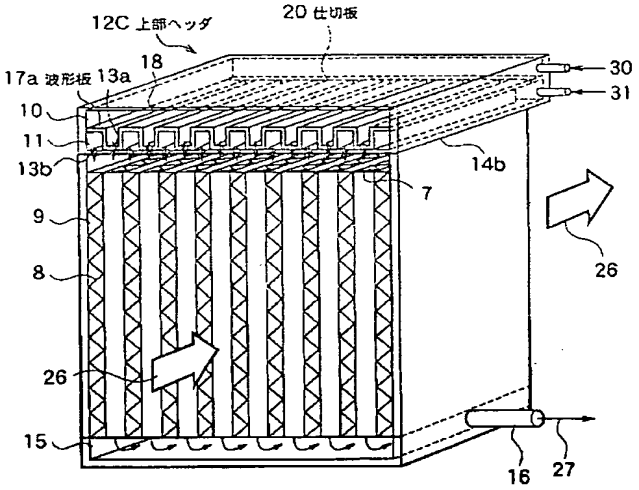
【図４】



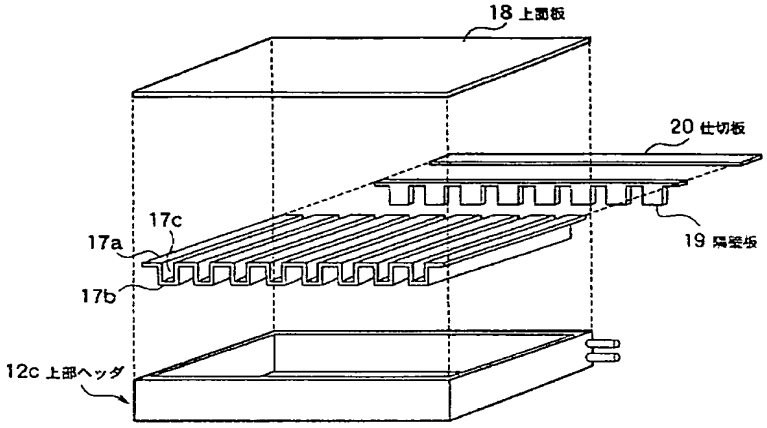
〔図２〕


6 蒸発器
12A
14a
14b
13a
30 メタノール
31 水
10 上段供給通路
11 下段供給通路
13b 供給孔
9 熱交換部
7 冷媒側フィン
26 排気ガス
8 熱媒側フィン
26
15 下部ヘッダ
16
27

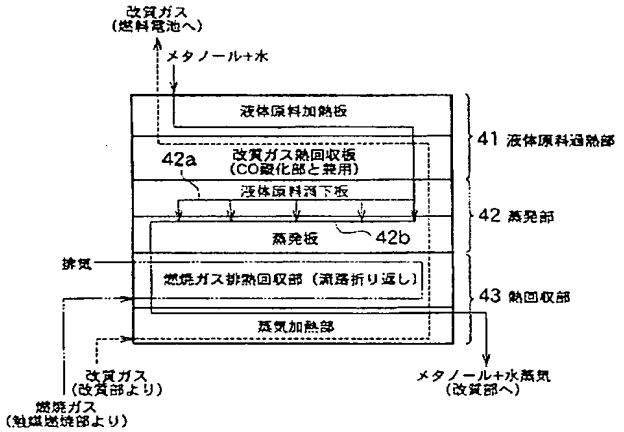
〔図５〕


12C 上部ヘッダ
20 仕切板
18
17a 波形板
13a
30
31
10
11
13b
14b
7
9
8
26
26
15
16
27

【図６】


18 上面板
20 仕切板
17c
17a
19 隔壁板
17b
12c 上部ヘッダ

【図７】


改質ガス
(燃料電池へ)
メタノール+水
液体原料加熱板
41 液体原料過熱部
42a
改質ガス熱回収板
(CO酸化部と兼用)
液体原料滴下板
42 蒸発部
蒸発板
42b
排気
燃焼ガス排熱回収部（流路折り返し）
43 熱回収部
蒸気加熱部
改質ガス
(改質部より)
燃焼ガス
(触媒燃焼部より)
メタノール+水蒸気
(改質部へ)

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Bibliography

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(51) [The 7th edition of International Patent Classification]

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C01B 3/32

[FI]

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[Patent Attorney]
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[Theme code (reference)]

4G040
5H027

[F term (reference)]

4G040 EA02 EA06 EB03 EB46
5H027 AA06 BA01 BA09 BA10 BA16

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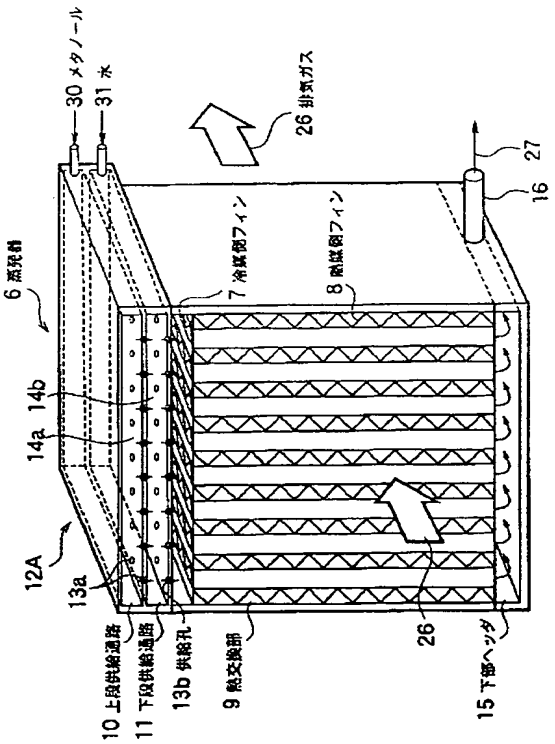
Epitome

(57) [Abstract]
[Technical problem] This invention is to offer the evaporator for fuel cells which can shorten a response time delay as much as possible, when changing the mixing ratio of a methanol and water and controlling a service condition.
[Means for Solution] Up header 12A which put the supply paths 10 and 11 which supply a methanol 30 and water 31, respectively on two steps is installed over the whole right above surface of the heat exchange section 9, and two or more feed holes 13a and 13b which pass the mixed liquor of a methanol 30, water 31, or a methanol 30 and water 31 are drilled in the inferior surface of tongue of each supply paths 10 and 11.

[Translation done.]



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CLAIMS

[Claim(s)]
[Claim 1] In the evaporator for fuel cells which generates the original fuel vapor which is made to evaporate the liquid Hara fuel which consists of a methanol and water, and serves as a fuel of the body of a fuel cell The up header which put the supply path which supplies said methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. The evaporator for fuel cells characterized by coming to puncture the inferior surface of tongue of each of said supply path two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water.
[Claim 2] Each inferior surface of tongue of both of the upper case supply path which is each supply path put on said two steps, and a lower-berth supply path is an evaporator for fuel cells according to claim 1 characterized by the monotonous thing.
[Claim 3] the feed holes of said upper case supply path, and abbreviation -- the evaporator for fuel cells according to claim 1 or 2 characterized by coming to puncture the same location the feed holes of said lower-berth supply path.
[Claim 4] The evaporator for fuel cells according to claim 1 or 2 characterized by coming to puncture [the feed holes of said lower-berth supply path] the location from which it separated with the feed holes of said upper case supply path.
[Claim 5] It is the evaporator for fuel cells according to claim 1 which the inferior surface of tongue of each of said supply path presupposes that it is monotonous at a corrugated plate and a lower-berth supply path at an upper case supply path, and joins the pars basilaris ossis occipitalis of the corrugated plate in said upper case supply path as said lower-berth supply path is monotonous, and is characterized by the feed holes of said upper case supply path penetrating and coming to carry out opening of the monotonous section of said lower-berth supply path in this joint.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the supply structure of the liquid Hara fuel in the evaporator for fuel cells about the evaporator for fuel cells.
[0002]
[Description of the Prior Art] As a configuration of the conventional evaporation section which generates the original fuel vapor which is made to evaporate a liquid Hara fuel and serves as a fuel of the body of a fuel cell, the thing as shown in drawing 7 is reported ("researches and developments of polymer electrolyte fuel cell" New Energy and Industrial Technology Development Organization (March, Heisei 10)).
[0003] The evaporation section consists of a liquid Hara fuel heating unit 41, an evaporator 42, and the heat recovery section 43 fundamentally. Among these, an evaporator 42 is constituted by liquid Hara fuel dropping plate 42a and evaporation plate 42b, and evaporates on evaporation plate 42b which the original fuel drop which liquid Hara fuel dropping plate 42a is the structure which prepared in the field the distributed hole which a liquid Hara fuel trickles, and was dropped installed in the lower part. Evaporation plate 42b has a concave convex heat transfer fin in a flat surface, makes a drop dropped between heat transfer fins, and is evaporated on an evaporation side. Under the present circumstances, the liquid Hara fuel which consists of a methanol and water has composition supplied to an evaporator 42, after mixing by the upstream of the evaporation section.
[0004]
[Problem(s) to be Solved by the Invention] However, in order to mix in the conventional technique before supplying the methanol and water which are a liquid Hara fuel to an evaporator, and to supply, when the mixing ratio of a methanol and water was changed and a service condition was controlled, only the time amount which discharges to an evaporator the original fuel which remains in a original fuel charging line had the trouble that responsibility fell.
[0005] This invention is to offer the evaporator for fuel cells which was made in view of the above, can shorten a response time delay as much as possible when changing the mixing ratio of a methanol and water and controlling a service condition as the purpose, and can control the vaporization ability fall of the heat exchange section.
[0006]
[Means for Solving the Problem] In the evaporator for fuel cells which generates the original fuel vapor which is made to evaporate the liquid Hara fuel which consists of a methanol and water, and serves as a fuel of the body of a fuel cell in order that invention according to claim 1 may solve the above-mentioned technical problem The up header which put the supply path which supplies said methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section, and let it be a summary to come to puncture the inferior surface of tongue of each of said supply path two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water.
[0007] In order that invention according to claim 2 may solve the above-mentioned technical problem, each inferior surface of tongue of both of the upper case supply path which is each supply path put on said two steps, and a lower-berth supply path makes a monotonous thing a summary.
[0008] in order that invention according to claim 3 may solve the above-mentioned technical problem -- the feed holes of said upper case supply path, and abbreviation -- let it be a summary to come to puncture the same location the feed holes of said lower-berth supply path.
[0009] Invention according to claim 4 makes it a summary to come to puncture [the feed holes of said lower-berth supply path] the location from which it separated with the feed holes of said upper case supply path in order to solve the above-mentioned technical problem.
[0010] In order that invention according to claim 5 may solve the above-mentioned technical problem, the inferior surface of tongue of each of said supply path is made monotonous at a corrugated plate and a lower-berth supply path at an upper case supply path, and joins the pars basilaris ossis occipitalis of the corrugated plate in said upper case supply path as said lower-

berth supply path is mono[redacted]ous, and let it be a summary that the f[redacted]holes of said upper case supply path penetrate and come to carry out opening of the monotonous section of said lower-berth supply path in this joint.

[0011]

[Effect of the Invention] According to this invention according to claim 1, the up header which put the supply path which supplies a methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. Since two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water were drilled in the inferior surface of tongue of each of said supply path Since each supply path for an up header unit is supplied at each **, it is mixed at the supply path of the lower berth and a methanol and water are supplied to the heat exchange section, when changing the mixing ratio of a methanol and water and controlling a service condition, a response time delay can be shortened as much as possible.

[0012] According to this invention according to claim 2, the up header which put the supply path which supplies a methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. In the configuration which drilled two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water in the inferior surface of tongue of each of said supply path Each inferior surface of tongue of the upper case supply path which is each supply path put on said two steps, and a lower-berth supply path It becomes possible to make thickness of each supply path thin as much as possible, and to make the volume of each supply path small compared with the amount of supply of a methanol and water, since [both] it is monotonous. Since feeding supply is carried out in the heat exchange section at homogeneity after the methanol or water supplied to the upper case supply path is mixed in a lower-berth supply path, when changing the mixing ratio of a methanol and water and controlling a service condition, it becomes possible to shorten a response time delay further.

[0013] According to this invention according to claim 3, the up header which put the supply path which supplies a methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. the configuration which drilled two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water in the inferior surface of tongue of each of said supply path -- setting -- the feed holes of an upper case supply path, and abbreviation, since the feed holes of a lower-berth supply path were drilled in the same location A methanol or water consists of an upper case supply path that the heat exchange section is easy to be supplied via the feed holes of a direct lower-berth supply path, and when changing the mixing ratio of a methanol and water and controlling a service condition, a response time delay until it can supply the original fuel of a predetermined mixing ratio can be shortened further.

[0014] According to this invention according to claim 4, the up header which put the supply path which supplies a methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. Since the feed holes of an upper case supply path drilled the feed holes of a lower-berth supply path in the location from which it separated in the configuration which drilled two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water in the inferior surface of tongue of each of said supply path Since the heat exchange section is supplied after mixing of a methanol and water is promoted at a lower-berth supply path, the vaporization ability fall of the heat exchange section can be controlled.

[0015] According to this invention according to claim 5, the up header which put the supply path which supplies a methanol and water, respectively on two steps is installed over the whole right above surface of the heat exchange section. In the configuration which drilled two or more feed holes which pass the mixed liquor of said methanol, water, or a methanol and water in the inferior surface of tongue of each of said supply path the inferior surface of tongue of each of said supply path At an upper case supply path, it is supposed at a corrugated plate and a lower-berth supply path that it is monotonous. Since the pars basilaris ossis occipitalis of the corrugated plate in said upper case supply path was joined as said lower-berth supply path is monotonous, and the feed holes of said upper case supply path penetrated and carried out opening of the

monotonous section of sa[redacted]wer-berth supply path in this joint Eve[redacted]en a methanol and water can be supplied to the direct heat exchange section, respective[redacted] and it changes the mixing ratio of a methanol and water, a response time delay until it supplies the original fuel of a predetermined mixing ratio can be shortened further.

[0016]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

[0017] (Gestalt of the 1st operation) Drawing 1 is drawing showing the fuel cell structure of a system containing the evaporator for fuel cells concerning the gestalt of operation of the 1st of this invention. First, it explains from this fuel cell structure of a system.

[0018] In drawing 1 , a compressor 1 supplies the air (oxygen) adopted from the outside to the fuel cell stack 2 and the reforming system 5. The fuel cell stack (body of a fuel cell) 2 is equipped with the anode pole 3 and the cathode pole 4, and it generates electricity to it using the hydrogen in reformed gas, and the oxygen in air.

[0019] An evaporator 6, the combustion catalyst 21 which generates the hot exhaust gas 26 used as the heat source of this evaporator 6, and its upstream are equipped with the dc-battery 25 which drives the mixer 22 by which sequential installation was carried out, an evaporating heater 23, and the methanol feed zone 24 and an evaporating heater 23 at the reforming system 5. It has CO removal section 29 which removes CO in the reforming section 28 which the original fuel vapor 27 and air from an evaporator 6 are furthermore supplied, and performs methanol reforming, and the reformed gas from this reforming section 28.

[0020] A methanol 30 is stored by the methanol tank and water 31 is stored by the water tank. Pumps 32a and 32b attract a methanol 30 and water 31, and it supplies to flow control valves 33a and 33b, and in flow control valves 33a and 33b, the amount of supply of a methanol 30 and water 31 is adjusted so that the original fuel vapor 27 generated with an evaporator 6 may serve as a presentation needed in the reforming section 28.

[0021] Drawing 2 shows the configuration of the above-mentioned evaporator 6.

[0022] In drawing 2 , the liquid Hara fuel which becomes the refrigerant side fin 7 from a methanol 30 and water 31 flows, the hot exhaust gas 26 flows on the heat carrier side fin 8, and the heat exchange section 9 is constituted by the attachment section of this refrigerant side fin 7 and the heat carrier side fin 8.

[0023] Moreover, cotton intermediary installation of the up header 12A which the upper case supply path 10 which supplies a methanol 30 to the heat exchange section 9, and the lower-berth supply path 11 which supplies water put on two steps of upper and lower sides is carried out all over right above [of the heat exchange section 9]. Opening of two or more feed-holes 13a which makes inferior-surface-of-tongue 14a of the upper case supply path 10 pass a methanol 30 is carried out to homogeneity over the whole inferior surface of tongue, and opening of two or more feed-holes 13b which makes inferior-surface-of-tongue 14b of the lower-berth supply path 11 pass the mixed liquor (liquid Hara fuel) of a methanol 30 and water 31 is carried out to homogeneity over the whole inferior surface of tongue. The lower header 15 and the original fuel vapor exhaust port 16 are formed in the lower part of an evaporator 6.

[0024] Next, an operation of an evaporator 6 is explained with actuation of a fuel cell system.

[0025] After supply initiation of the air 35 is carried out through the air supply way 34 at a mixer 22 by the compressor 1 at the time of starting of the reforming system 5, a methanol 30 is supplied from the methanol feed zone 24. After being evaporated with an evaporating heater 23, it is mixed with air 35 with a mixer 22, and a methanol 30 burns with the combustion catalyst 21.

[0026] Moreover, it is introduced into a mixer 22, and is mixed and the anode gas 36 and the cathode gas 37 which are discharged from the fuel cell stack 2 after starting burn with the combustion catalyst 21. The heat of the exhaust gas 26 generated in the case of these the combustion of each is used as a heat source of an evaporator 6.

[0027] In an evaporator 6, a methanol 30 and water 31 are exceptionally supplied to the upper case supply path 10 and the lower-berth supply path 11 through flow control valves 33a and 33b, respectively. A methanol 30 is once supplied to the lower-berth supply path 11 through feed-holes 13a from the upper case supply path 10, after being mixed with water in the lower-berth

supply path 11, it passes [redacted]-holes 13b, and it is supplied to the he[redacted]xchange section 9 as a liquid Hara fuel.

[0028] Here, exhaust gas 26 and heat exchange are performed, and the evaporated original fuel vapor 27 serves as reformed gas 38 through the reforming section 28 and CO removal section 29, and is sent to the anode pole 3 of the fuel cell stack 2. Air 35 is sent to the cathode pole 4 of the fuel cell stack 2 by the compressor 1, and a generation of electrical energy is performed here using the hydrogen in reformed gas 38, and the oxygen in air 35.

[0029] Since it acts as mentioned above, and a methanol 30 and water 31 are supplied to the upper case supply path 10 and the lower-berth supply path 11 at each **, are mixed at the lower-berth supply path 11 in front of the heat exchange section 9 and the heat exchange section 9 is supplied, an evaporator 6 can shorten a response time delay as much as possible, when changing the mixing ratio of a methanol 30 and water 31 and controlling a service condition. Here, each inferior surfaces of tongue 14a and 14b of the upper case supply path 10 in up header 12A and the lower-berth supply path 11 are both monotonous, and opening of two or more feed holes 13a and 13b is carried out to homogeneity over the whole inferior surfaces of tongue 14a and 14b, respectively as shown in drawing 2 .

[0030] For this reason, ** which makes thin thickness of each supply paths 10 and 11 of an upper case and the lower berth as much as possible, and makes sufficiently small the volume of each supply paths 10 and 11 compared with the amount of supply of a methanol 30 and water 31 is made. After being mixed in the lower-berth supply path 11, feeding supply of the methanol 30 and water 31 which were supplied to the upper case supply path 10 and the lower-berth supply path 11 through flow control valves 33a and 33b at each ** by this is carried out in the heat exchange section 9 at homogeneity.

[0031] Consequently, the response time delay in the case of changing the mixing ratio of the original fuel-supply response delay to the heat exchange section 9 at the time of starting of the reforming system 5 or a methanol 30, and water 31, and controlling a service condition can be shortened further.

[0032] Moreover, it is the location where the location of feed-holes 13b by which opening was carried out to inferior-surface-of-tongue 14b of the location of feed-holes 13a and the lower-berth supply path 11 by which opening was carried out to inferior-surface-of-tongue 14a of the upper case supply path 10 is the same as shown in drawing 3 .

[0033] Since the methanol 30 from the upper case supply path 10 becomes by this that the heat exchange section 9 is easy to be supplied via feed-holes 13b of the direct lower-berth supply path 11, when changing the mixing ratio of a original fuel, a response time delay until it can supply the original fuel of a predetermined mixing ratio can be shortened further.

[0034] (Gestalt of the 2nd operation) Drawing 4 is drawing showing the configuration for an up header unit of the evaporator for fuel cells concerning the gestalt of operation of the 2nd of this invention. In addition, it has the same fundamental configuration as the gestalt of the 2nd operation, and the evaporator for fuel cells corresponding to the gestalt of the 1st operation which is mentioned later and which shows the gestalt of the 3rd operation to drawing 2 , and the same sign is given to the same component, and suppose that the explanation is omitted.

[0035] With the gestalt of the 2nd operation, as shown in drawing 4 , in the configuration of up header 12B, opening of the feed-holes 13b of the lower-berth supply path 11 is carried out to feed-holes 13a of the upper case supply path 10 in the location from which it separated.

[0036] Thereby, the methanol 30 supplied from the upper case supply path 10 is once suspended at the lower limit supply path 11, without supplying the direct heat exchange section 9, and mixing with water 31 is promoted. For this reason, the original fuel mixed by abbreviation homogeneity is supplied to the heat exchange section 9, and can control the vaporization ability fall of the heat exchange section 9.

[0037] (Gestalt of the 3rd operation) Drawing 5 is drawing showing the configuration of the evaporator for fuel cells concerning the gestalt of operation of the 3rd of this invention.

[0038] With the gestalt of the 3rd operation, as shown in drawing 5 , the inferior surface of tongue of the upper case supply path 10 in up header 12C is joined to inferior-surface-of-tongue 14b which it is corrugated plate 17a, and pars-basilaris-ossis-occipitalis 17b of

corrugated plate 17a turn[illegible]o from the plate in the lower-berth su[illegible]path 11.
[0039] And in this joint, feed-holes 13a of the upper case supply path[illegible]0 penetrates inferior-surface-of-tongue 14b of the lower-berth supply path 11, and opening is carried out. The upper case supply path 10 has prepared predetermined spacing between corrugated plate 17a at the bottom and the plane top-face plate 18, and has composition which each **** 17c can open for free passage.
[0040] As shown in drawing 6 , the end side of each **** 17c in the upper case supply path 10 is blockaded by the curtain board 19. Two or more prismatic form centrums which are constituted by two or more prismatic form centrums formed between inferior-surface-of-tongue 14b which consists of the rear face and plate of corrugated plate 17a in the upper case supply path 10, and constitute this lower-berth supply path 11 are opening the lower-berth supply path 11 for free passage by the space between inferior-surface-of-tongue 14b which consists of a dashboard 20 and a plate.
[0041] Since the gestalt of the 3rd operation is constituted in this way, it can supply a methanol 30 or water 31 to the direct heat exchange section 9 from the upper case supply path 10 or the lower-berth supply path 11.
[0042] Even when it constitutes the supply path of a methanol 30 and water 31 in piles up and down, and even when control of flow can be respectively performed according to an individual, the heat exchange section 9 can be supplied and it changes the mixing ratio of a original fuel, response delay can be controlled and controlled by this.
[0043] In addition, although the methanol path and the lower-berth supply path 11 are made into the water supply path for the upper case supply path 10 with the gestalt of each operation mentioned above, an operation and effectiveness are the same as that of the above about the upper case supply path 10 also considering a water supply path and the lower-berth supply path 11 as a methanol supply path.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the fuel cell structure of a system containing the evaporator for fuel cells concerning the gestalt of operation of the 1st of this invention.
[Drawing 2] It is the perspective view showing the configuration of the evaporator for fuel cells concerning the gestalt of operation of the 1st of this invention.
[Drawing 3] It is drawing showing the 1st configuration for an up header unit of the gestalt of operation.
[Drawing 4] It is drawing showing the configuration for an up header unit of the evaporator for fuel cells concerning the gestalt of operation of the 2nd of this invention.
[Drawing 5] It is the perspective view showing the configuration of the evaporator for fuel cells concerning the gestalt of operation of the 3rd of this invention.
[Drawing 6] It is the decomposition perspective view showing the 3rd configuration for an up

header unit of the gestalt of operation.
[Drawing 7] It is drawing showing the basic configuration of the evaporation section in the conventional fuel cell system.
[Description of Notations]
2 Fuel Cell Stack (Body of Fuel Cell)
6 Evaporator
9 Heat Exchange Section
10 Upper Case Supply Path
11 Lower-Berth Supply Path
12A, 12B, 12C Up header
13a, 13b Feed holes
14a, 14b Inferior surface of tongue which consists of a plate
17a Corrugated plate
17b The pars basilaris ossis occipitalis of a corrugated plate
30 Methanol
31 Water

[Translation done.]

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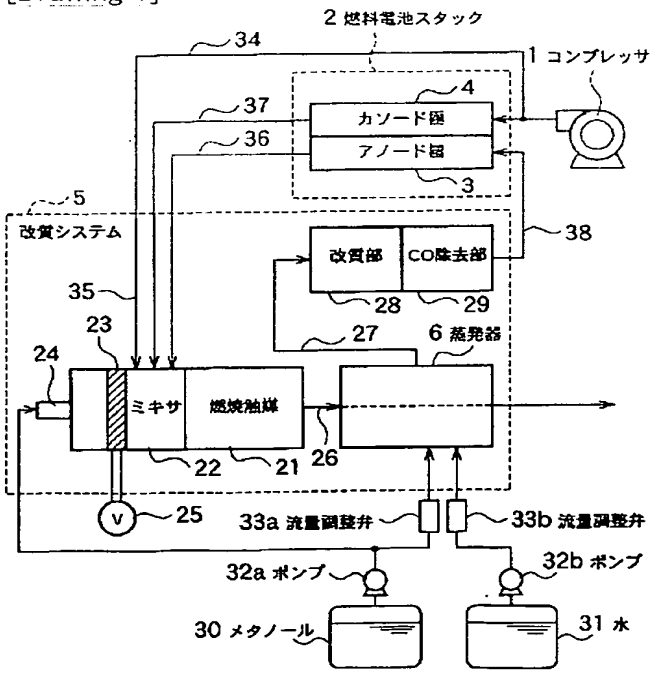
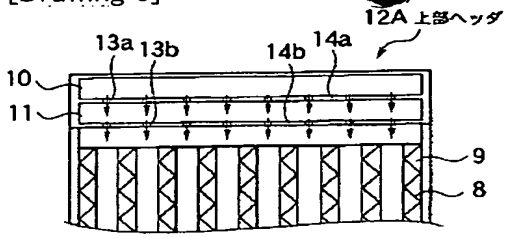
DRAWINGS

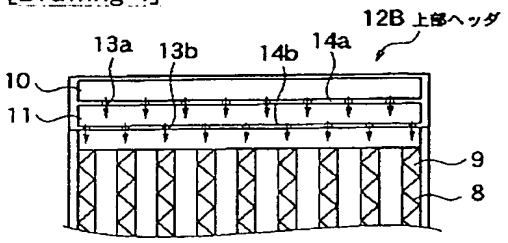
[Drawing 1]



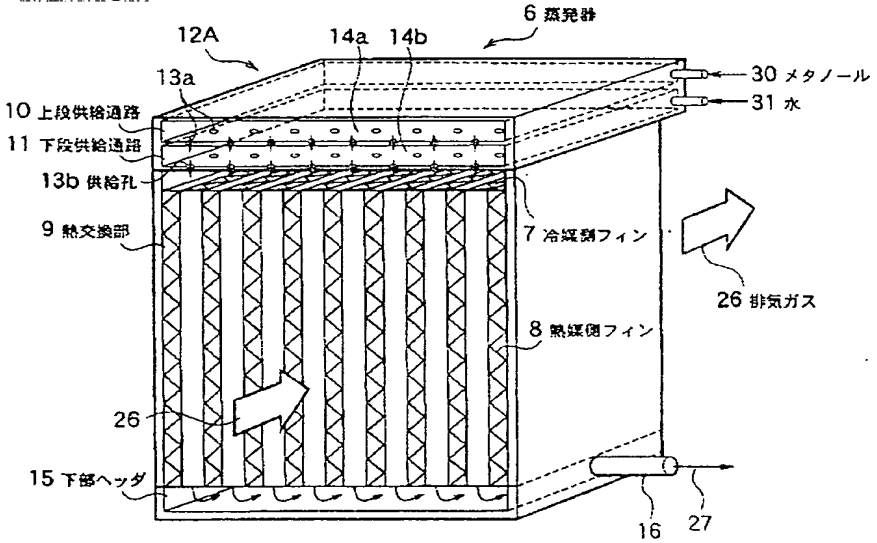
[Drawing 3]



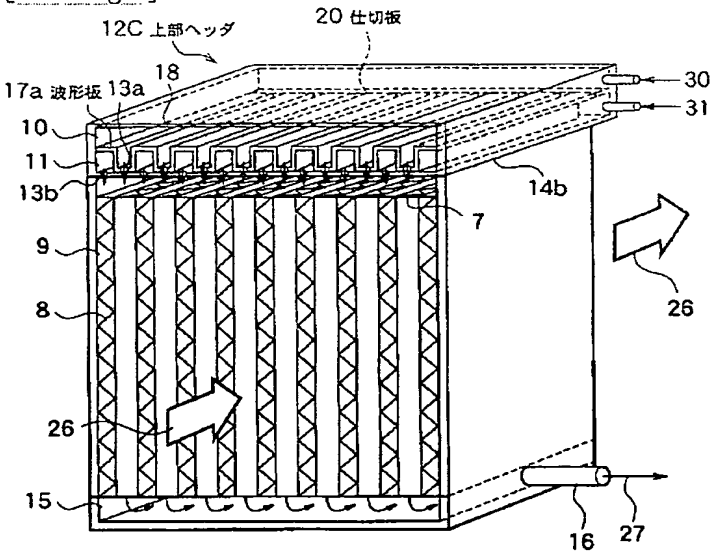
[Drawing 4]



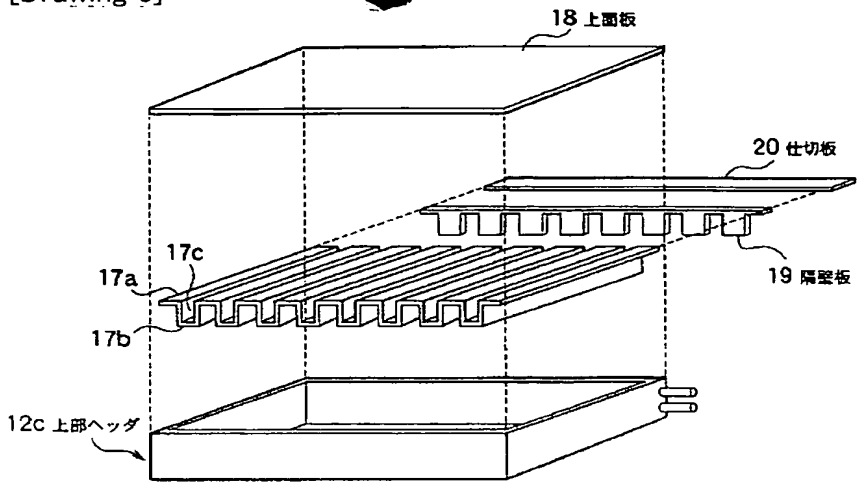
[Drawing 2]



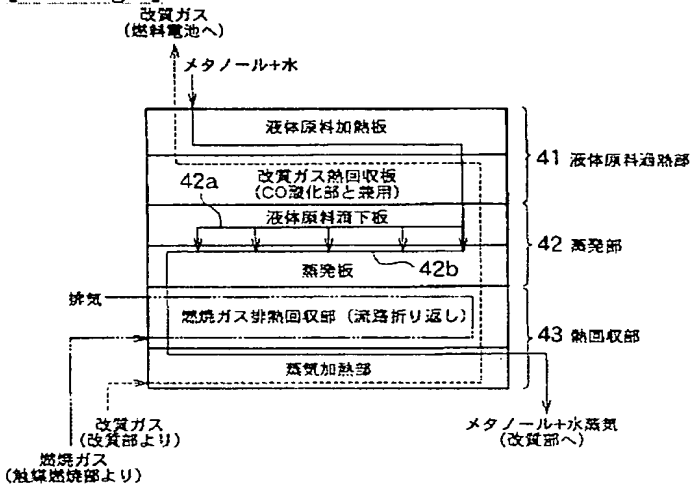
[Drawing 5]



[Drawing 6]



[Drawing 7]



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